

olivetti

LOGOS 75 SERIES

75S - Scientific
75B - Business

STAC CODE: 920.45.2

Technical Updating Manual 39

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INTRODUCTION

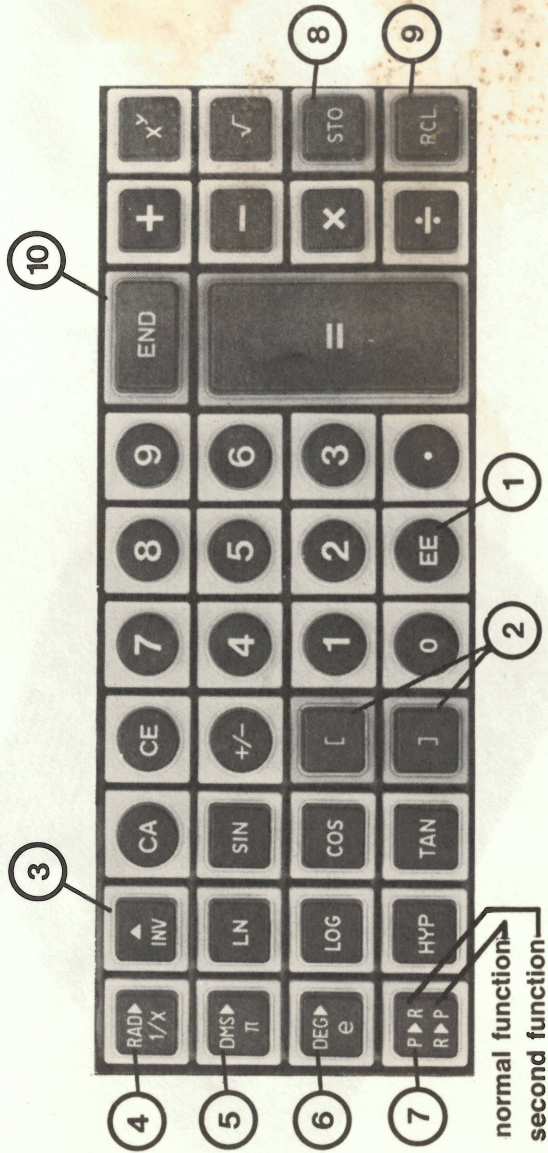
The LOGOS 75 Series resembles the L40 series calculators in appearance only: they are styled similarly, and use the Olivetti Serial Parallel Printer, and are of very modular construction. However, the L75 series calculators are complex, specialized machines aimed at specific market segments. In fact, the L75 Business calculator is unique in the marketplace.



LOGOS 75S SCIENTIFIC CALCULATOR

The keyboard of the LOGOS 75 S is equipped with 38 keys and four selector switches. In addition to the numeric keys zero through nine, the decimal and change-sign keys, the central part of the keyboard includes the Enter Exponent key for automatic powers of ten, Clear Entry and Clear All keys. Peripheral to the numeric keys are those required to complete the entry and start the execution of the formula: open and closed parentheses, Equals sign, End, Store and Recall keys.

To the right of the numeric keys are the single-function keys for add, subtract, multiply, divide, power and square root. To the left are trigonometric and logarithmic keys, which can be inverted by first depressing the Inverse key.



At the extreme left of the keyboard are four keys with double identification. These are double function keys, and the normal function is the lower identification, while the upper is the function that the key performs when preceded by the Inverse key.

LEARN FREE OPERATING MODE SWITCH

The two positions are FREE and LEARN. In FREE mode, the LOGOS 75 S calculates the entered formula as you enter it. In LEARN mode, the formula is stored until you depress END, and then calculated all at once. You can re-calculate using different values.

ENG NORM SCIEN NOTATION SWITCH

This defines the format in which numbers are printed and displayed.

DMS DEG RAD ANGULAR MODE SWITCH

This switch defines the units of angular expression (Degrees/Minutes/Seconds, Radians, or Decimal Degrees), except when angular conversions are performed.

0 1 2 3 4 5 6 FL DECIMAL SWITCH

defines the decimals of the printed and displayed results.

ENTER EXPONENT

Separates the mantissa from the exponent of ten in the entry of a number in engineering or scientific notation.

OPEN and CLOSED PARENTHESES

These enclose parenthetic expressions in the formula to be calculated. The closed parenthesis commands the printing of the intermediate result of the expression.

INVERSE/SHIFT UP

When depressed immediately before one of the following keys, this one causes the inverse (of the log and trig keys) or the upper function (on the dual-function keys).

RAD to SWITCH Converts an angle in radians to the units selected on the Angular Mode switch.

RECIPROCAL Automatically calculates the reciprocal of a number or expression.

DMS to SWITCH Converts an angle in Degrees/Minutes/Seconds to the units selected on the Angular Mode switch. π Automatically enters 3.141592654.

DEG to SWITCH Converts an angle in decimal Degrees to the units selected by the Angular Mode switch. **e** Automatically enters 2.718281828.

POLAR to RECTANGULAR This does just the opposite of below.

RECTANGULAR to POLAR Converts rectangular coordinates of a point (x, y) to polar coordinates (r, θ).

STORE

Stores a number in one of the memory registers. The number must be entered first, then STORED, in the desired register.

RECALL

Recalls the contents of a memory register, addressed after depressing the RECALL key.

END

(used only in LEARN mode) This key tells the machine that formula loading is over, and that it is to calculate the result.

Capacity

LOGOS 75 S operates internally in scientific notation, that is, with mantissae and exponents. The mantissa can be one digit to the left of the decimal, and up to nine decimal positions, and the exponent (power of ten) may be two digits.

Maximum capacity: mantissa 10 digits
exponent 2 digits

Maximum data range: ± 9.999999999 × 10⁹⁹
± 9.999999999 × 10⁻⁹⁹

Error conditions occur if these limits are exceeded.

Memory

The memory of the LOGOS 75 S is organized into the following specialized areas: Functions, Data Registers, Working Memory, Input/Output Register and Keyboard Buffer.

Function Memory

The Function memory will memorize all the functions that compose a formula, including parentheses, Store and Recall, Equals and End. The capacity of the memory is 128 steps. Each stored function occupies a single step. The occupation flow of this memory is automatically controlled by LOGOS 75 S such that each function is placed in the first free position. There are differences between the two operating modes in the way this memory works:

LEARN MODE

Statically memorizes the formula exactly as entered in order to repeat it with new variables;

FREE MODE

Temporarily memorizes those functions which cannot be executed immediately, because of hierarchy principles. As soon as LOGOS 75 S executes a pending function, it frees the corresponding memory step which is available for the next entered function.

Data Memory

The Data Memory is composed of 40 registers; the capacity of each register is as described under Capacity Thirty-two of these registers can be addressed directly using the Store and Recall keys. The other eight registers are used by the machine for pending operations and are not accessible by the operator.

Working Memory

During the execution of a formula, the Working Memory temporarily memorizes numeric data; it is composed of six registers of the same capacity described. The Working Memory is not accessible by the operator.

Input/Output Register

The contents of this register are always displayed; its capacity is similar to the other machine registers. The Input/Output (I/O) register memorizes all entries, all intermediate and final results, all data recalled from Data Memory, and the values of π and e when recalled.

Keyboard Buffer

The Buffer has a capacity of eight steps, which can be either numeric entries or operations.

Display

LOGOS 75 S has a 14-digit vacuum tube display, using the familiar seven-segment characters. Numbers are displayed in the format shown below:

SIGN OF MANTISSA
OR NUMBER

MANTISSA OF NUMBER

EXPONENT

-

1.234567891

99

SIGN OF EXPONENT

EXAMPLES:

FINDING VOLUME
OF A SPHERE:

$$\frac{4}{3} \times \pi \times R^3$$

This is the formula for volume of a sphere.
Radii for two spheres are presented here.

(let R = 4.23, then change to
R = 6.147)

LEARN FREE		ENG NORM SCIEN		DMS DEG RAD		0 1 2 3 4 5 6 FL	
KEY SEQUENCE		DISPLAY		PRINTOUT			
4		4		LEARN			
÷		4		4	R00	÷	
3		3		#00	3		
×		3.141592654		#01	R01	×	
π		3.141592654		3.141592654	R02	×	
4.23		4.23		#02	R03	×	
X ^y		4.23		4.23	X1Y		
3		3		#03	R04	=	
=		3.17036826		#04	END		
=		4		#05	RES		
=		3		317.036826			
=		3.141592654					
(now enter the new value of R, and de- press = to substitute into the next register)							
6.147		6.147		4	R00		
END		972.9225035		3	R01		
				3.141592654	R02		
				6.147	R03		
				972.9225035	RES		

The calculation is preformed in LEARN mode so that it could be re-
peated easily for the second sphere.

CONVERSION OF POLAR COORDINATES TO RECTANGULAR:

Find the XY coordinates of a point located by angle and radius.



enter θ
depress $\frac{R}{\theta}$
enter R
depress =
NOTE: angular notation of θ must be entered correctly: if necessary,
convert angular notation via the sequence(s) described in example 83.

LEARN FREE		ENG NORM SCIEN		DMS DEG RAD		0 1 2 3 4 5 6 FL	
KEY SEQUENCE		DISPLAY		PRINTOUT			
130.3242		130.3242		FREE			
INV		130.3242					
P>R		130.3242		130.3242			
8		8		8			
=		5200360555		6.079165247			
				-5.200360555			

By depressing INV, you select the upper function of the dual-
identification keys; in this case Polar-to-Rectangular.

LOGOS 75B BUSINESS CALCULATOR

The LOGOS 75 B is a business calculator with printer and display. It is an entirely new and professional office machine designed using the latest technology to help you solve business and accounting problems. It is the ideal machine for offices where the calculations performed have a certain degree of complexity, are repetitive, or require various totals.

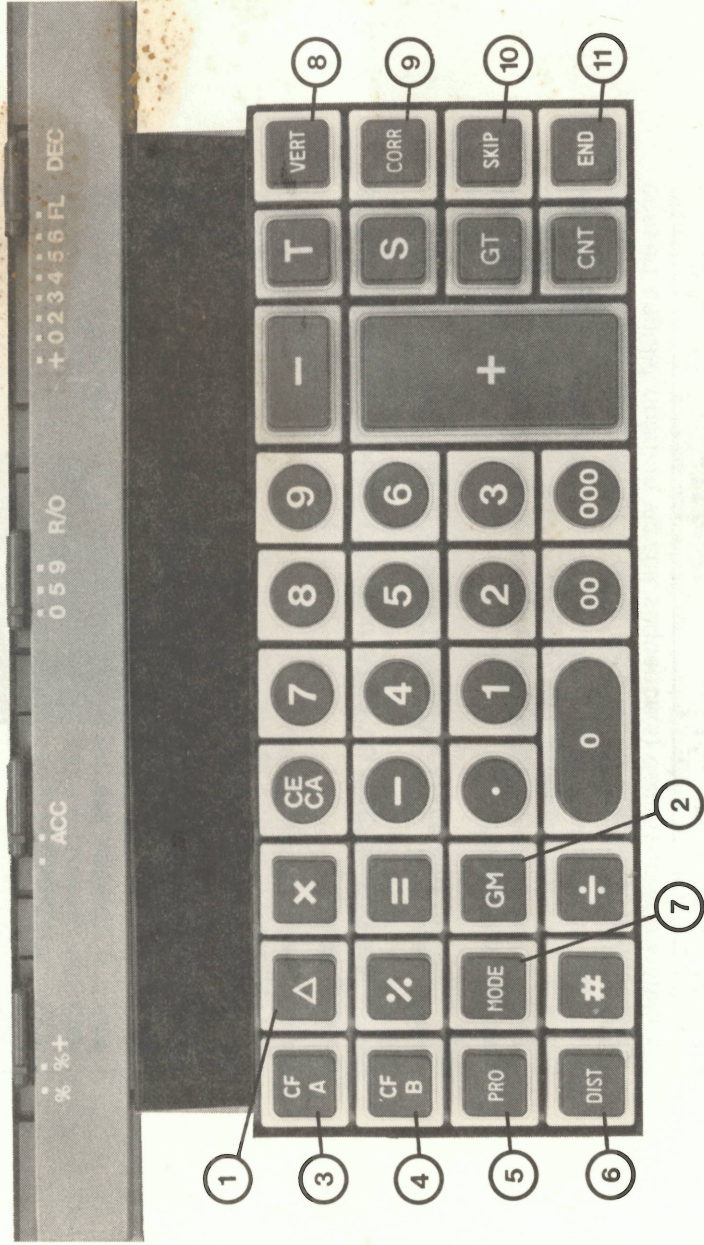
The LOGOS 75 B offers you:

Pre-programmed functions:

- Amount and percent of increase or decrease
- Gross margin—computes the selling price when the mark-up based on selling price is known
- Percent plus or minus calculations to compute taxes, discounts, and net amount
- Pro-ration
- Pro-ration with allocation
- Distribution with columnar analysis

Programmability:

- the ability to learn a calculation sequence of a master row
- the ability to enter many rows following the master row
- the ability to make corrections within a program
- the ability to analyze and compare totals



Percent Switch: When set at "%", the Percent Key enters the second factor in multiplication as a percent and completes the calculation. When set at "% + ", the Percent Key enters the second factor in multiplication as a percent and completes the calculation printing the mark-up or discount and the net amount.

Percentage division is not affected by the setting of this switch.

1 Delta or Percent Change Key: Depress to enter the first factor in a comparison. After the second number has been entered and the Equals Sign Key depressed the difference and the percent of increase or decrease will be printed.

2 Gross Margin Key: Depress to enter the gross margin as a percent. Gross margin is mark-up based on selling price.

Constant: The second entry in multiplication, division and percentage calculations as well as the first factor in gross margin and percent change can be used as constants. Constants are marked on the tape with a K.

Program Keys:

3 Crossfoot A: Used to select a program to add up to 48 columns vertically and horizontally. The horizontal lines can contain sums and grand totals.

4 Crossfoot B: Used to select a program to add up to 24 columns vertically and horizontally. With the Accumulator Switch at ACC sums and grand totals can be computed both vertically and horizontally.

5 Pro-ration Key: Used to select a program that permits the addition of up to 52 entries (with Accumulator Switch off) or 26 entries (Accumulator Switch on). After entries are accumulated the percentage pro-ration, that is, how much (in percentage) each entry is over the total, is printed. It is then possible to allocate amounts using these percentages. With the Accumulator on, these allocations can be accumulated.

6 Distribution Key: Used to select a program that permits the distribution of up to 52 different categories with the Accumulator Switch off or up to 26 different categories with sums and grand total if the Accumulator Switch is on.

7 Mode Key: Used to go from Program Mode to Manual Mode or to go from Manual Mode to a program which had previously been selected.

8 Vertical Key: Used in crossfoot programs to accumulate factors which are not automatically accumulated. In Crossfoot B with the Accumulator off factors that have been accumulated can be used as constants by depressing the Vertical Key.

9 Correct Key: Used to make corrections within programs.

10 Skip Key: Used in Crossfoot A and B to leave a space for a column where no corresponding value appears when entering the program (1st line). Also used within a program to skip columns where no entry is required.

11 End Key: Used in Crossfoot A and B to terminate horizontal lines, and in Pro-rating and Distribution to close the data entry phase.

Crossfootting A permits the addition and/or subtraction of up to 48 columns of numbers, with both horizontal and vertical totals available. Reference numbers can be entered using the Non Add Key, they will not accumulate. When entering numbers the horizontal line number is printed automatically in the center of the tape before each line is entered. The vertical line number or column number is printed to the left of the tape each time a number is added to or subtracted from that column. The Accumulator Switch has no effect on this program selection.

To Set Up a Program—Enter the first horizontal line just as it appears, just as you would on any calculator. If horizontal totals are desired, total the line after all entries have been made. Once the line has been entered depress the End Key.

To Run a Program—Enter all the other lines by keying-in the numbers and depressing the Add Key. Subtotals, Totals and horizontal Grand Totals will be automatically printed. All function keys except the Add Key and Subtract Key are inoperative while running a program.

To Obtain Horizontal Totals—Depress the Subtotal Key to print the totals without clearing the registers, or depress the Total Key to print the totals and clear the registers.

Example:

1. Find Horizontal Totals
2. Find Vertical Totals

Account Number	1	2	3	4	Total
25	123	132	146	187	588
76	697	384	291	861	2233
99	408	562	721	340	2031
84	196	293	396	201	1086
Total	1424	1371	1554	1589	5938

Select program

Reference (Account) Number 25

Horizontal Total of

Account

End program

Enter all other lines

using the Add Kev. The

line totals will be

automatically printed.

Depress Total Key to
print Vertical Totals.

PRO PRO-RATION—SIMPLE

Simple pro-rata is performed by adding a column of numbers. When all entries have been made depress the End Key. The End Key is the signal to the machine that all entries have been made; the total will be printed. To print out the pro-rata depress the Total Key.

Example:

1. Find the Total Sales
2. Find the % over the Total

Dept	Sales	% of Total
A	12,768	16.27
B	14,961	19.06
C	8,868	11.30
D	15,200	19.37
E	17,680	22.53
F	9,000	11.47
	<u>78,477</u>	

Enter	Depress	Tape
-------	---------	------

Select program

PRO 26

01	12 768,00+
02	14 961,00+
03	8 868,00+
04	15 200,00+
05	17 680,00+
06	9 000,00+
	78 477,00G

End program and

print Total

print Pro-Ration

DISTRIBUTION—With Accumulation

To perform several distributions and get their Grand Totals, set the Accumulator to ACC and perform the distribution as shown. At the end simply depress the Grand Total key, followed by the Total key to print the Grand Total of all category amounts, items and the percentages they represent.

Appliance Department Sales, Monday, January 5.

Store A		Store B		Store C	
Category	Price	Category	Price	Category	Price
1	129.68	2	675.00	1	235.65
2	435.71	3	199.00	1	477.86
4	685.00	7	29.95	1	279.00
3	295.00	7	65.85		
1	99.95				
7	19.95				

1. Find category totals of items and amounts for each store

2. Find category totals of items and amounts for all stores combined:

Store A			Store B			Store C			Grand Totals		
Category	Amount	No. of Items	Category	Amount	No. of Items	Category	Amount	No. of Items	Category	Amount	No. of Items
1	229.63	2	33.33%			1	992.51	3	1	1222.14	5
	13.79%	33.33%					100.00%	100.00%		33.69%	38.46%
2	435.71	1		2	675.00	1			2	1110.71	2
	26.16%	16.67%			69.60%	25.00%				30.62%	15.38%
3	295.00	1		3	199.00	1			3	494.00	2
	17.11%	16.67%			20.52%	25.00%				13.62%	15.38%
4	885.00	1							4	685.00	1
	41.13%	16.67%								18.88%	7.69%
7	19.95	1		7	95.80	2			7	115.75	3
	1.20%	16.67%			9.88%	50.00%				3.19%	23.08%
TOTAL	1665.29	6		TOTAL	969.80	4	TOTAL	992.51	3		

KEYBOARD

The Olivetti LOGOS 75 Series calculators are electronic Print/Display calculators with fully alphanumeric printout. Logic boards contain four or five MOS-LSI devices, plus IC drivers and discrete components. The L-75S Scientific model also includes a CMOS dual flip-flop, which is required for the Olivetti Serial Parallel Printer.

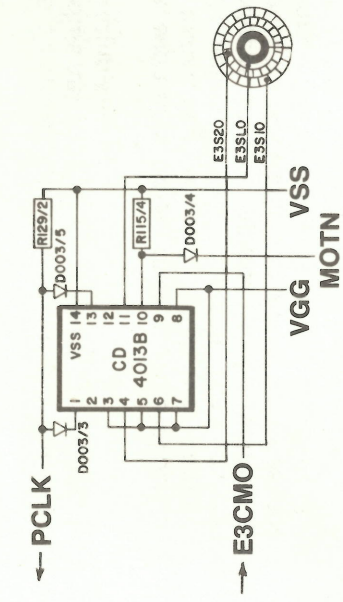


Fig. 2

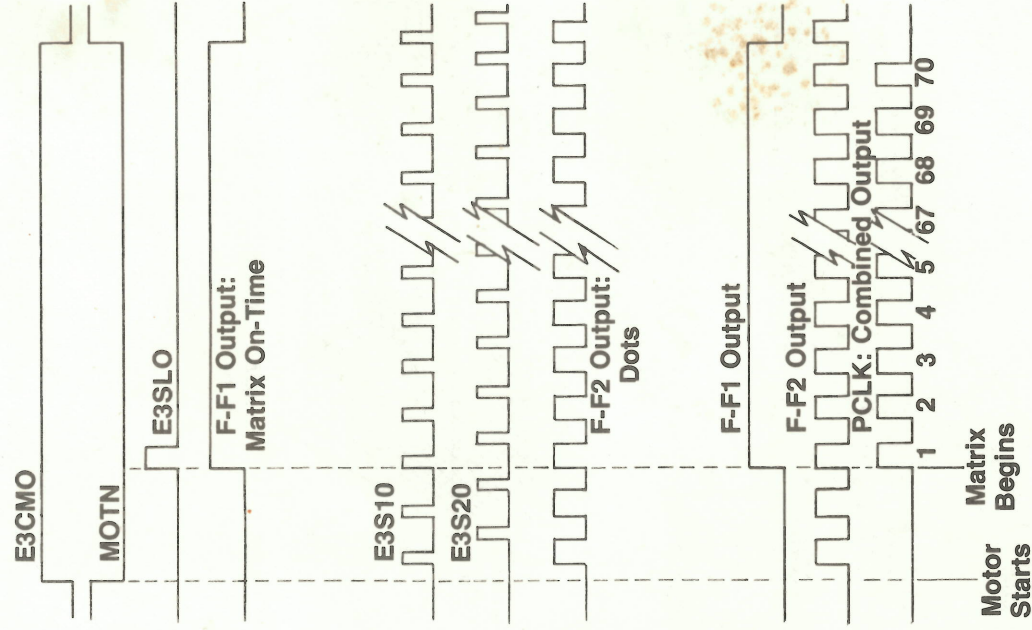


Fig. 3

This discussion is about the role of the CMOS dual flip-flop during printing. The complexity of the LOGOS 75S requires the strobe disc signals (E3SLO, E3S10 and E3S20) to be combined into one composite signal, PCLK; the two I/O pins thus liberated are required by the larger display of the 75S, and a possible future output device option.

In this explanation the two flip-flops are identified as F-F1 (pins 8, 9, 10, 11 and 13 of the CMOS) and F-F2 (pins 1, 3, 4, 5 and 6). Respectively they deal with Matrix On-Time, and the dots themselves.

F-F1 is alerted when E3CMO and MOTN (pins 9 and 10) invert to start the printer motor. (This inversion is caused by the motor circuit.) The motor starts, and as E3SLO reaches pin 11 of F-F1, the flip-flop will switch and pin 13 (output) becomes positive, and stays positive through the end of the 70 dots of the matrix.

The other half of the flip-flop (F-F2) receives the alternating dot-print signals E3S10 and E3S20. With each alternating signal, this half will switch, and when both of the flip-flops are positive, there will be a pulse of PCLK produced. This pulse corresponds approximately to the E3S10 signal. When E3S20 occurs, F-F2 will switch off; PCLK will be off, also.

Diodes D003/3 and D003/5 form a positive AND gate that combines the signals of the flip-flops into one signal: PCLK, which signals matrix dot-print positions to the I/O MOS device, pin 20.

This continues, dot by dot, until 70 PCLK dot-print signals have been sent to the MOS device for selection, after which time the signals E3CMO and MOTN will invert again to stop the printer.

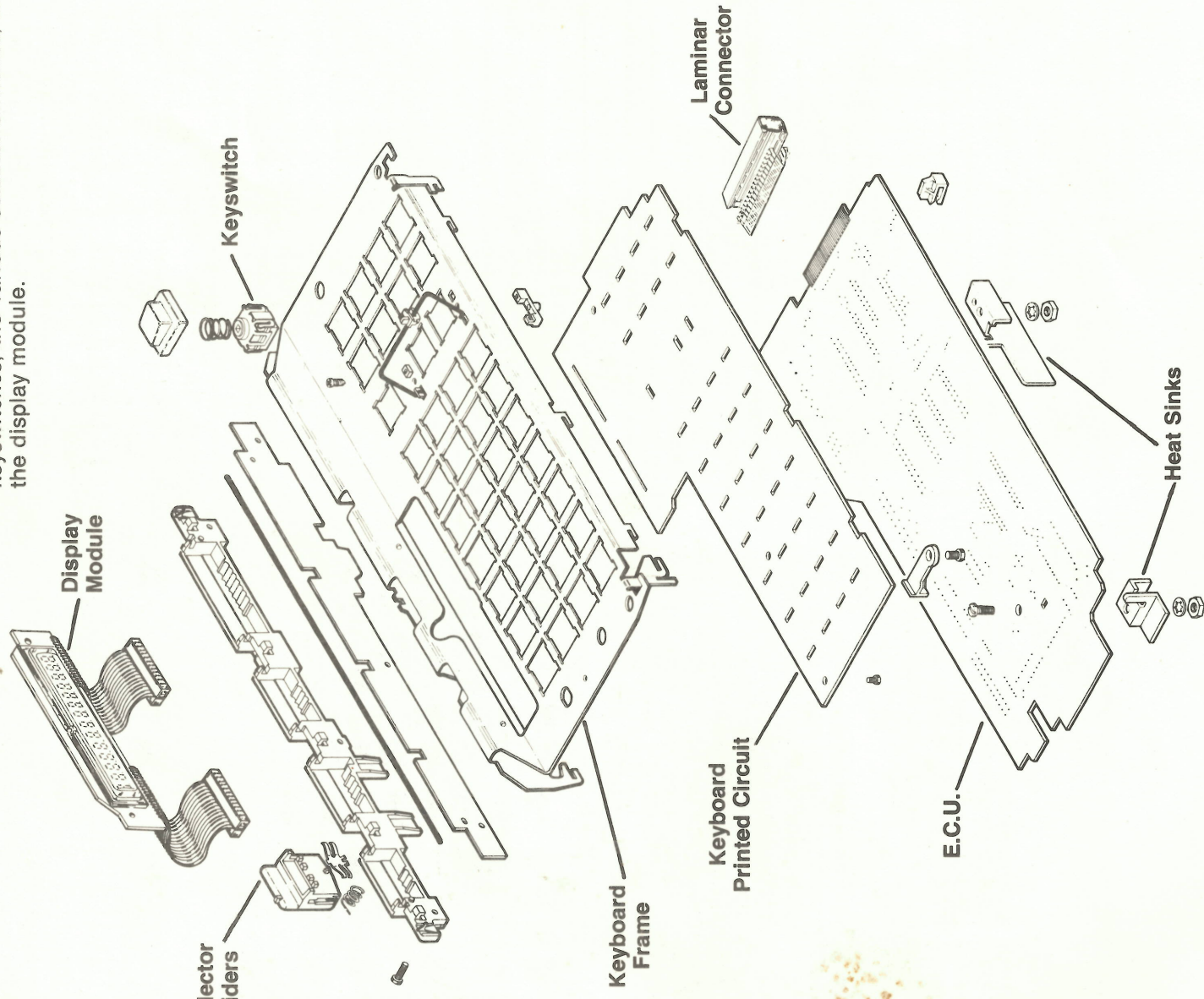


Fig. 4: ECU/Keyboard Module

THE OLIVETTI SERIAL PARALLEL PRINTER

The Olivetti Serial Parallel Printer is an electro-mechanical device that uses ten printing needles to produce dot-matrix characters. See fig. 5.

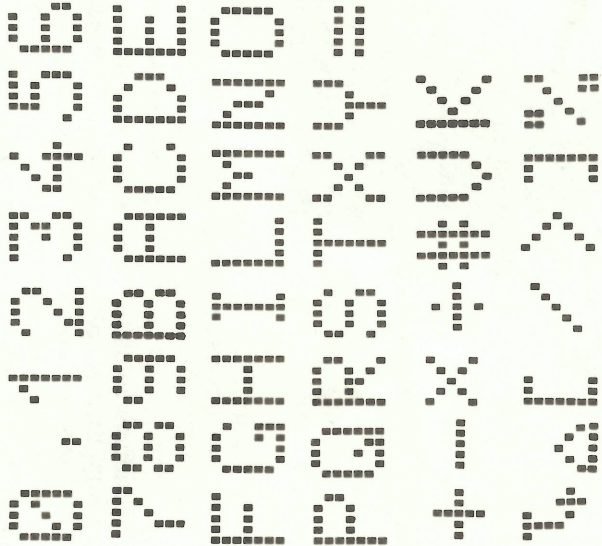


Fig. 5: Characterization

The printing field is 20 characters wide: three for symbols; 17 for numerals, decimal point and sign; six for messages to the operator. See fig. 6.

PRINT POSITIONS																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
																	SYMBOL FIELD		
																	ALPHA (message) FIELD		
																	NUMERIC FIELD		

Fig. 6: Character Field

While this explanation is primarily mechanical, the printer is controlled in every way by the E.C.U. This relationship should be kept in mind during the following description.

Each character's matrix is five dots wide and seven dots high. As the platen advances, the needles move back and forth over a two-character span while striking the ribbon in the required dot patterns. Printing occurs while moving in both directions, right-to-left and left-to-right, except on the return of the last sweep while the platen linespaces. See fig. 7.

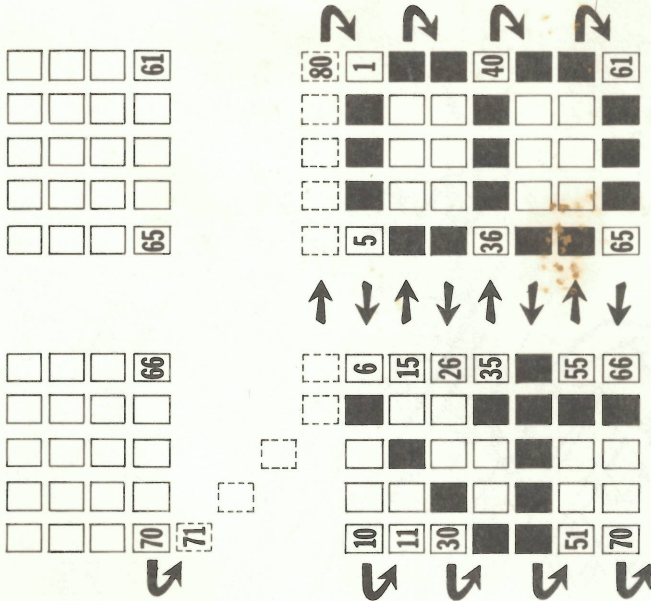


Fig. 7: Dot Progression

The printer's major components include a five-pole DC motor; the ten print needles with their anchors and guide; the bobbin assembly and its spacer (made of a magnetic rubber); the print springs, trilobed reset shaft and springs; the platen and platen advance mechanism; the strobe disc which furnishes the dot print signals to the E.C.U. for selection; the main control cam and gears.

Simultaneous motions of the printer during a print cycle are as follows: The print needle guide moves side-to-side, the reset shaft rotates, the platen advances upward by one-dot increments, and the rotating strobe disc sends timed print signals to the E.C.U. for dot selection. In addition to the other movements, the needles strike the ribbon when printing dots. These simultaneous motions are explained in greater detail in the following pages.

THE PRINTING MECHANISM

Prior to printing, the entire mechanism is at rest. Rest position for the needles is achieved when the needle is held away from the platen by its respective bobbin. The anchor is held against its respective bobbin by a constant magnetic field produced by the magnetic rubber. See fig. 8.

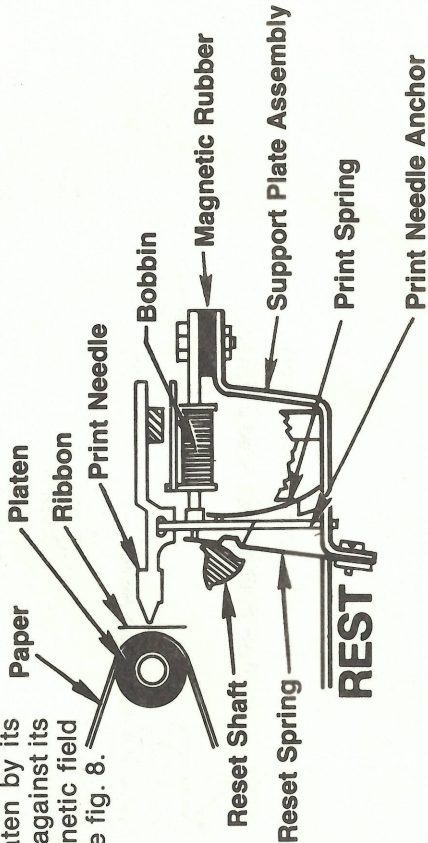


Fig. 8

When a print cycle begins, the E.C.U. starts the motor, and simultaneously the strobe disc sends dot print signals to the E.C.U. for selection. A selected dot signal energizes the bobbin for the respective needle which interrupts the magnetic field holding its anchor in place. The released needle is spring-driven to the ribbon, causing a dot to appear on the paper. See fig. 9.

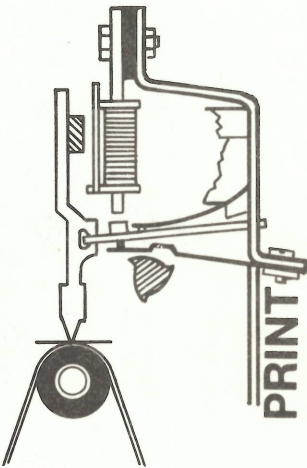


Fig. 9

Between each printed dot the needles are reset into their rest position. One of the three lobes of the rotating reset shaft will push the reset spring which pushes the anchor and needle back against the bobbin. The bobbin has since been de-energized, and the restored magnetic field holds the anchor and needle against the bobbin. See fig. 10.

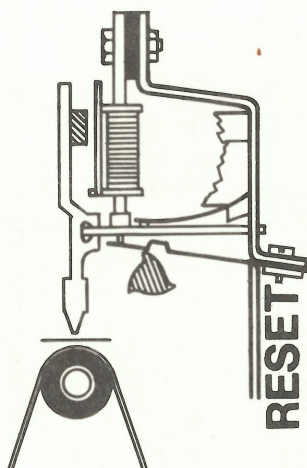


Fig. 10

The lobe of the rotating reset shaft moves away from the reset spring and anchor, and the anchor is held in place by the restored magnetic field. The needle is immediately ready for another print command from the E.C.U. See fig. 11.

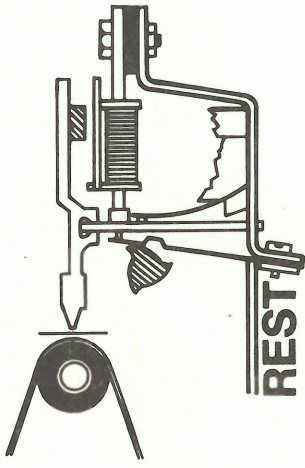


Fig. 11

DISPLAY OPERATION

A brief review of basic electronics will help clarify the operation of the display tube. A filament with a negative referenced voltage is a source of electrons. A plate (or character segment) is a target for those electrons. A grid allows or prevents the passage of electrons. Electrons will flow from the filament to the segments only when the grid AND the segments are positive. This process is called Thermionic Emission.

The display tube has 104 segments (including decimal points) to be lighted, but if only uses 21 leads to do it. The process by which this is accomplished is called MULTIPLEXING, and is worth understanding. There are thirteen grids, one for each character, and eight segment lines as identified here. (See fig. 18)

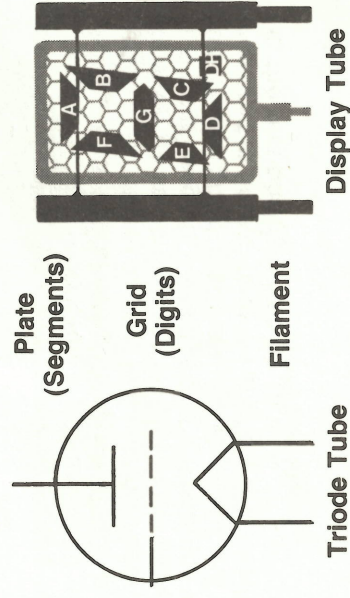


Fig. 18: Comparison of Triode and Display

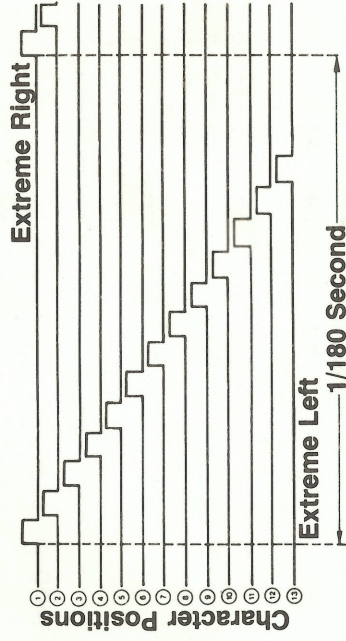


Fig. 19: Scanning the Display

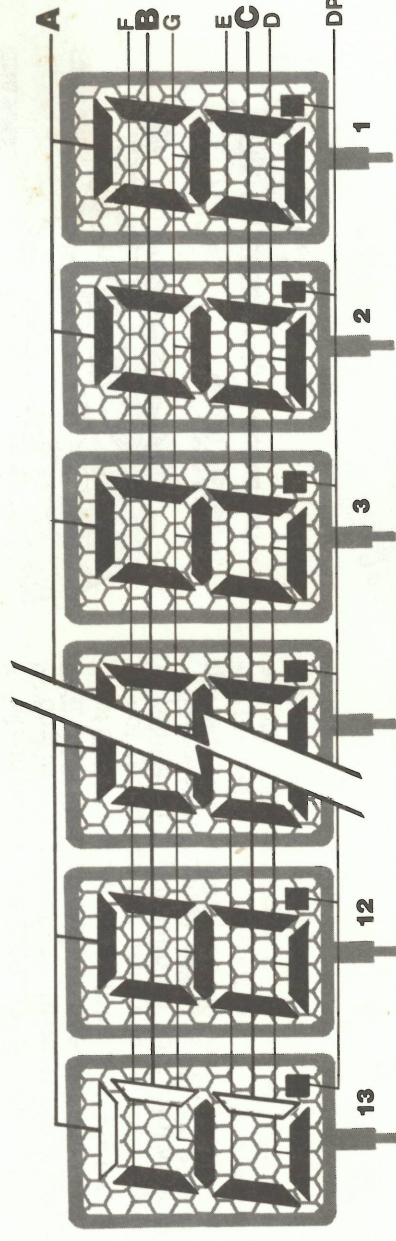


Fig. 20: Example (Filament Omitted for Clarity)

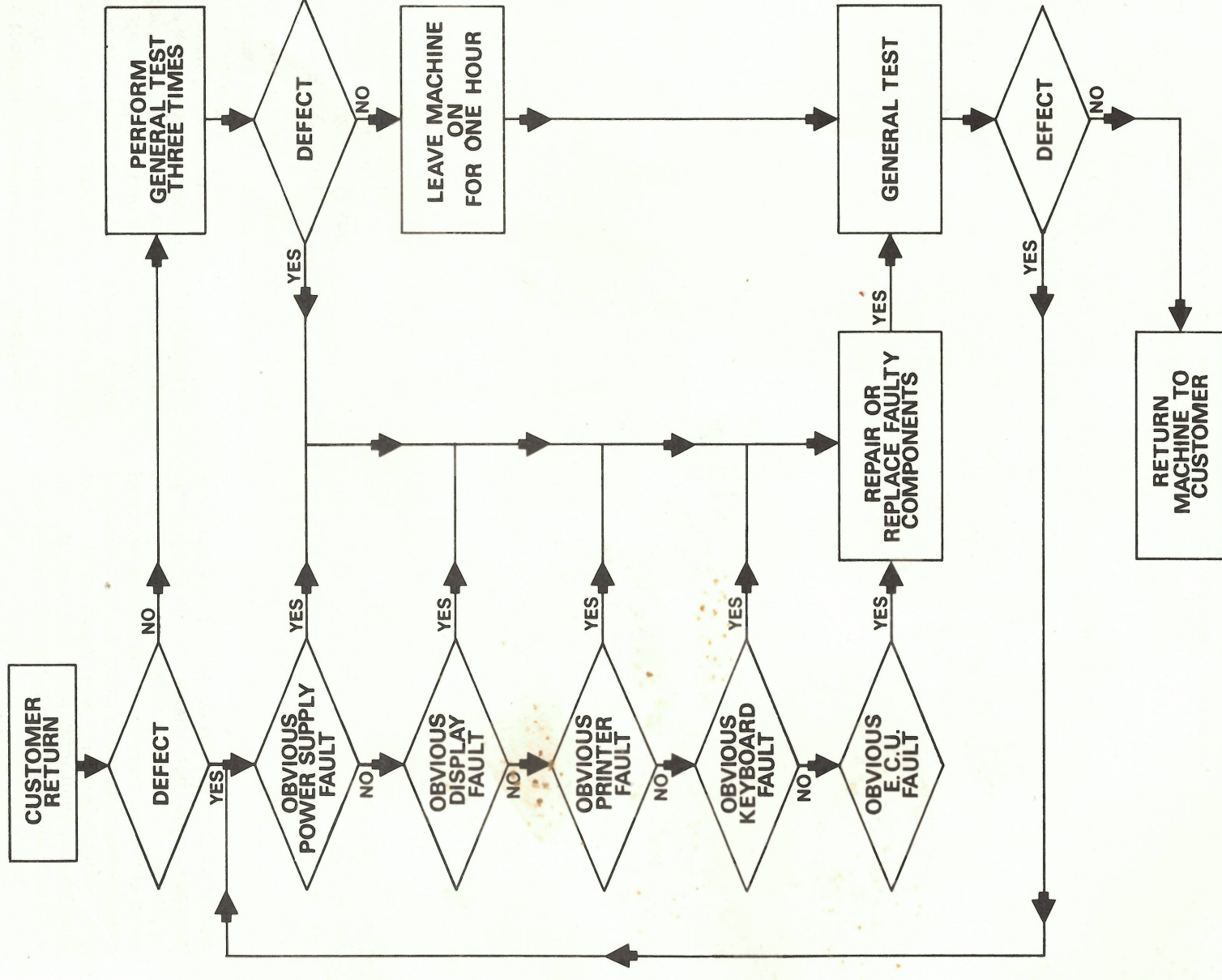
Consider a hypothetical figure (7) at the extreme left of the display. The character grids would be switched position in sequence (scanned), from the first position to the 12th but no segments would be switched. At the 13th position the grid is scanned as usual, but the segment lines A, B, and C are switched as well. When this happens, at the

13th position, the grid AND the segments A, B and C are positive, and electrons will flow from the filament to the segments, causing them to light. While the light appears to be constant, each character is illuminated for a fraction of 1/180 of a second.

DIAGNOSTIC PROCEDURE

The calculators are serviced at two different levels:

- 1st Level: Branch Service
- 2nd Level: Lab Repair of ECU



The entire machine is so easily serviced that the labs will only be involved if the ECU fails or is damaged, and only the ECU will be sent to the lab.

SPECIAL TOOLS

The only special tools required to service the calculators are the extension cables. A meter and the standard tools for typewriter and calculator work will serve for any maintenance or repair.

The cables permit the machine to operate in a disassembled condition; this is a benefit of the modular design. There is an additional cable required for the PD machines, as the power supply has more leads. The new power supply cable is:

PD Power Supply Cable -

Part Number 025005 P

The technician will still require the L40/42 cable set (part number 025008 S) consisting of one each:

Keyboard/E.C.U. cable -

Part Number 025006 Q and

Printer/E.C.U. Cable -

Part Number 025007 R.

SUPPORTIVE MATERIAL

Technical education on the L75 series is achieved primarily by self-instruction.

One publication for each calculator combines the 1st and 2nd level technical manual material, in sections. The 1st level section deals primarily with the printer; 2nd level material emphasizes electronics - complete coverage of operation - and the General Test. The manual includes fault-finding, service and repair, and parts lists, and is written as the self-instruction course.